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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/805,304	03/12/2001	Jae Hwan Kim		2103

EXAMINER	
GRAHAM, ANDREW R	

ART UNIT	PAPER NUMBER
2644	3

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DATE MAILED: 03/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/805,304	KIM, JAE HWAN	
	Examiner	Art Unit	
	Andrew Graham	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-6 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-6 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 12 March 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Specification

The disclosure is objected to because of the following informalities: ***

- page 5, line 12, the word "smarty" should be "smart"
- page 6, line 11, "member3" should be "member 3"
- page 7, lines 5-6, the words "van dyke" are not capitalized as they are in line 8 of the same page
- page 9, line 1, "Ad" appears as if it should be "As"
- line 2 of Claim 1, "nose" should be "noise"

Appropriate correction or clarification is required. The applicant's assistance in correcting any similar discrepancies in the application that are not specifically listed above is respectfully requested.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. **Claims 2-6** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 2 recites the limitation "the piezoelectric member" in the third and fourth lines of the claim. There is insufficient antecedent basis for this limitation in the claim, because the previous reference to "piezoelectric members" was plural. Clarification in terms the number of members connected to the shunt circuit is required.

Claims 3 and 4 are rejected due to their dependencies upon Claim 2.

Claim 5 recites the limitation "the opposite board structures" in line 5 of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 5 recites the limitation "the board structure" in line 7 of the claim. There is insufficient antecedent basis for this limitation in the claim, because the previous limitations in the claim cite "one board structure" and "opposite board structures", and it is unclear as

to which of these board structures this phrase of "the board structure" is referring.

Claim 6 recites the limitation "the board structure" in line 1 of the claim. There is insufficient antecedent basis for this limitation in the claim, because the previous limitations in Claim 5 cite "one board structure" and "opposite board structures", and it is unclear as to which of these board structures this phrase of "the board structure" is referring.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. **Claims 1, 5, and 6** are rejected under 35 U.S.C. 103(a) as being unpatentable over Baz (USPN 5485053) in view of Burdisso et al (USPN 5355417). Hereafter, "Burdisso et al" will simply be referred to as "Burdisso".

Baz discloses a method and device for an active constrained layer damping system for vibration and sound control of planar structures. The basic embodiment of such a system involves four layers, a flexible structure or beam (20), an unconstrained damping

layer (10), a constrained damping layer (50), and a piezo-electric detecting layer (40) (col. 2, lines 20-43). The active damping is executed by first receiving the vibration in the piezo-electric detecting layer (40), amplifying or otherwise processing (60) the signal by a separate unit, and then using the signal to control the constrained damping layer (50) to counteract or suppress the vibration (col. 2, lines 37-42). Figures 3, 24, 25, and 28 show a few of the various embodiments of the combined layers disclosed by Baz. The overall system of Baz reads on "an improved smart panel for a wide band noise reduction" (col. 10, lines 25-36). The flexible structure or beam (20) reads on "a board structure for decreasing a noise of an audible frequency band" (col. 10, lines 32-36). The unconstrained layer, which involves a visco-elastic layer, provides relatively small damping compared to a constrained damping layer, and is generally shown in Figure 1 (col. 2, lines 19-23 and col. 7, lines 56-65). The two piezo-electric layers which form the smart constraining layer read on "a piezo electric unit attached to the board structure for decreasing the noise" (col. 6, lines 22-26 and col. 7, lines 66-67 and col. 8, lines 1-20). Baz discloses that the fundamental mode of the beam is one of several that may be addressed by the active constrained later (col. 5, lines 2-4).

However, the examples of the tested flexible structures do not specify:

- that the noise is decreased when the same audible frequency as the resonance frequency of the board structure is propagated

Burdisso discloses a sound-canceling panel that involves the use of piezo-electric actuators. The panels used in this system are designed to have a resonance frequency near the tone to be cancelled (col. 12, lines 14-17). This is because the maximum response or vibration of the panel occurs at the frequency of fundamental resonance (col. 12, lines 56-60). Burdisso includes piezoceramic elements to actually 'tune' the resonance frequency of the panel (col. 12, lines 60-68). This form of sound canceling panel reads on "decreasing the noise when the same audible frequency as the resonance frequency of the board structure is propagated".

To one of ordinary skill in the art, it would have been obvious to modify the board structure of Baz to have a "tuned" fundamental resonance frequency that approximates the frequency of sound being received or to be absorbed by the board structure, as is taught by Burdisso. The motivation behind such a modification would have been that the combined system would have been useful to specifically attenuate structural vibrations caused by sound.

Regarding Claim 5, please see Claim 1 regarding the limitations of the "improved smart panel", "board structure", and "piezoelectric unit". Regarding the "sound absorption member", Baz discloses that a sandwiched plate may be treated with patches of the damping layers (Figure 28). This connection of the visco-elastic material to an inner surface of the flexible plates reads on "a sound absorption member attached to an inner surface of one board structure among the

opposite board structures for decreasing the noise of an audible frequency band".

Regarding Claim 6, again, Baz discloses that patches of damping layers may be positioned between inner and outer shells or enclosures (col. 5, lines 34-45). Figure 32 illustrates that these patches may be positioned in particularly oriented strips. The spacing between each patch is coplanar or in the same radius as the visco-elastic layers (10), and is between the inner and outer shells (24,25) reads on "in said sound absorption member, an air layer is formed between the board structure positioned in the opposite surfaces. It is further noted that, as in Figures 24 and 25, the shapes of the layers may be particularly and independently shaped according to the desired bending mode damping.

4. **Claims 2-4** are rejected under 35 U.S.C. 103(a) as being unpatentable over Baz in view of Burdisso as applied above, and in further view of Wu (USPN 5783898).

As detailed above, Baz discloses an active constrained layer damping system for absorbing or damping structural sound or vibrations. Burdisso discloses the concept of utilizing a damping panel with a fundamental resonance frequency that approximates the frequency of sound or vibration to be absorbed. Baz discloses a variety of embodiments involving the three different layers and the board structure. Figure 25 illustrates an embodiment where one

piezo-electric layer is on one side of the beam (20) while the visco-elastic layer is connected to the opposite side of the beam (20). Figure 27 illustrates the use of patches of the damping layers which are optimally placed to control several of the bending modes (col. 5, lines 11-16). Figure 28 illustrates a sandwiched plate with patches of the damping layers (col. 5, lines 16-27). Baz also particularly notes that a wide variety of multi-layer and discretely placed damping layers may be configured to cancel sound (col. 7, lines 48-54). Collectively, these teachings of various embodiments read on "said piezoelectric unit includes a plurality of piezoelectric members attached to the back surface of the board structure to which the sound absorption member is attached". Baz also discloses that a variety of strain control strategies may be used, including various forms of feeding back the voltage applied from the piezo-electric sensor (40) (col. 7, lines 29-40).

Baz does not specify:

- one of these control schemes as being an electronic shunt

Wu discloses the use of fully passive, non-complex components to reduce vibrational amplitudes in structures. The reduction involves the use of shunt circuitry, wherein a variety of combinations of inductances, resistances, and capacitances are connected in parallel across a piezoelectric material (col. 3, lines 17-47 and Figures 2-6). A variety of vibrational modes can be damped from one piezoelectric patch (col. 5, lines 6-9). Wu also discloses an embodiment wherein a plurality of piezoelectric patches are connected

in parallel to shunt control circuitry (32). In view of the control scheme presented by Baz in view of Burdisso, the teachings of this embodiment read on "shunt circuit connected with the piezoelectric member".

To one of ordinary skill in the art at the time of invention, it would have been obvious to include the tunable shunt circuitry of Wu as a part of the circuitry connected to the damping system of Baz in view of Burdisso. The motivation behind such a modification would have been that the passive approach of Wu would have added a degree of damping with a lesser degree of complexity than an active, feedback approach. Baz already includes passive physical damping, the teachings of Wu would have added another form of passive, though electronic, damping. Including passive damping circuitry to the electronic connections of the piezoelectric components of the system of Baz in view of Burdisso would have also been desirable because it would have enabled a plurality of modes to be tunably damped at a single structural location across a single electronic connection.

Regarding **Claim 3**, Burdisso discloses that the maximum response is obtained by driving the vibrating structure at its fundamental resonance frequency (col. 12, 56-60). This is because the highest degree of flex or vibration of the surface occurs at its fundamental resonance frequency. Baz discloses that the patches in certain embodiments may be optimally placed according the damping of desired modes (col. 5, lines 10-15). Collectively, these teachings and the

relative physics read on said piezo electric members are attached to an anti-nodal point which generates maximum displacement of the board structure for maximizing the noise reduction effect.

Regarding **Claim 4**, the shunt circuitry embodiments of Wu include a dissipation element (44) including a resistance and an inductance tuned to the natural frequency of the mode of vibration that is to be damped (col. 3, lines 49-64 and Figure 2). This reads on "said shunt circuit is formed of a resistor and an inductor device and is tuned for electrically resonating an electric impedance of each piezoelectric member".

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Graham whose telephone number is 703-308-6729. The examiner can normally be reached on Monday-Friday, 8:30 AM to 5:00 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Isen can be reached on (703)305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Andrew Graham
Examiner
A.U. 2644

ag
March 22, 2004

MINSUN OH HARVEY
PRIMARY EXAMINER